**PCA Worksheet and Homework**

1. Find the eigenvectors for the following covariance matrix. This is the one from the notes.  
     
   
2. Compute the covariance matrix given the following “toy” dataset:

|  |  |
| --- | --- |
| X1 | X2 |
| 2 | 4 |
| 3 | 7 |

**Answer:**

|  |  |
| --- | --- |
| 0.5 | 1.5 |
| 1.5 | 4.5 |

1. Find the eigenvalues of the following covariance matrix:

|  |  |
| --- | --- |
| 1 | 2 |
| 2 | 4.3 |

**Answer:**

0.0572 and 5.2428

1. Find the eigenvectors for the eigenvalues above. Convert them to unit vectors before reporting them.  
     
   **Answer:**  
     
   [0.9045, -0.4264]  
   and  
   [0.4264, 0.9045]
2. Find the values of the data from #4 using the first principal component. The first principal component corresponds to the eigenvector that captures the maximum variability.  
     
   **Answer:**

|  |  |  |
| --- | --- | --- |
| X1 | X2 | PC1 |
| 2 | 4 | 4.4709 |
| 3 | 7 |  |

1. Why would a data scientist use principal component analysis?